Amputations of the Hand and Fingers*

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AMPUTATION at the hand or digital level may be necessitated by accidental trauma, infection or tumors. It is indicated in the useless, unsalvagable, stiff and deformed finger.

The salvage of all possible function, the preservation of life or limb and the improvement of function and appearance are the roles amputation must play in these several situations.

Apposition of the opposing thumb and fingers, grasp, and hook are the three basic functions of the hand to be preserved, attained or sacrificed as the case may be. Since apposition and grasp are by far more important than only hook, the preservation of almost any sort of a thumb is better than no thumb at all. Stiffness and deformity which render a finger useless may well leave the thumb the most useful member of the hand. Similarly, with a multiple loss of fingers, one or two remaining stiff and ordinarily useless fingers, if sufficiently flexed to permit grasp in opposition to the thumb, will salvage a major function.

The stability of grasp and the leverage power on pronation and supination depends on the length of the hand-lever as measured from the hypothenar pressure pad to the second metacarpal-phalangeal pressure pads. For many manual workers, preservation of even a short index stump would be of mechanical value. To others, the appearance of the hand would be a disadvantage. However, a single short stump of the middle, ring and little fingers adds nothing to function or appearance. Both function and appearance are improved by doing an oblique osteotomy of the metacarpal and closing the space or smoothing the ulnar border of the hand. Many persons with only three fingers have friends who have never noticed the loss.

THE USEFUL STUMP

With the indications for and the roles of hand and finger amputations in mind in relation to the basic functions to be conserved, the surgeon may well consider a given case in terms of what sort of stump will be useful.

A good stump is painless on occupational activity. It is free from infection and from circulatory and trophic disturbances. It should possess tactile sensibility. Pressure areas and stump ends are best covered with palmar skin and pad. But sacrifice of an interphalangeal joint to avoid an end or palmar scar when essentially normal skin is available, ignores the many useful pain-free finger stumps seen in industry with end and palmar scars. Freedom from pain on use is a far better criterion of function than the location of the scar. However, it should be emphasized that unless it is reasonably likely that a useful stump will be obtained, enough bone should be removed to cover the end adequately with palmar skin.

GENERAL PRINCIPLES OF THE SURGICAL TECHNIQUE

Complete anesthesia, a bloodless field, absolute avoidance of a finger tourniquet or epinephrine in the finger block, and careful cleansing and debridement if a traumatic amputation is present, are basic initial steps.

All useful skin should be conserved to permit as long a stump as possible. Flaps should include, in one layer skin, subcutaneous tissue, deep fascia, the flexor tendon sheath, and the dorsal aponeurosis and the digital vessels.

The digital nerves should be sufficiently withdrawn before sectioning so that they will retract out of the scar and away from pressure over the bone end.

If the base of the distal or middle phalanx is preserved, the profundis and sublimus tendons insure strong flexion motion. In middle phalangeal amputations the flexor profundis tendon is permitted to retract. In the occasional instance where a single or multiple short proximal phalangeal stumps are the best that can be obtained, adequate flexion motion will be present in the absence of tendon suture. In no instance should a flexor tendon be sutured to the extensor apparatus.

The bone should be exposed extraperiosteally. The bone is sectioned and the end carefully smoothed, leaving no frayed periosteal shreds to form painful spurs. The cartilage may be removed from the phalangeal head. If the vitality of the flap is impaired, the raw bone end will afford an additional source of blood supply.

Upon release of the pneumatic cuff, a few minutes' pressure will control the oozing. The digital vessels will have been clamped and tied with very fine suture material. Any further bleeding points should be grasped with fine forceps and tied. Many stumps are very nicely closed by carefully approximating skin edges with fine non-absorbable suture material which are tied without tension. In others, a few deep sutures are helpful.

A moderately firm compression dressing, with the hand in the position of partial grasp and the inclusion of a splint from the fingers to the upper forearm, completes the dressing. Elevation postoperatively will avoid the post-operative stasis often encountered when the hand is dependent.

When healing has occurred, gradually progressive use is the best reconditioner.

TRAUMATIC AMPUTATIONS

Small tip defects will cover over spontaneously or with a little traction. Complete tip and slice defects of the whole dermis are best treated by skin grafting. Recently Allen has reported major complete or nearly complete traumatic amputations of the fingers including a joint, with healing made

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possible by following suture with careful refrigeration. Probably for some time, major digital traumatic defects will ordinarily be treated by completing the amputation so as to leave a useful stump.

The more extensive crushing injuries of the hands and fingers should be treated as outlined by Doctor Kirkpatrick at this symposium and definitive procedures should be left until the final situation can be precisely evaluated. When it is clear that a metacarpal-phalangeal amputation is necessary, use of a long oblique osteotomy to secure a smooth edge of the hand is obvious. Should metacarpals four and five require removal, they should be sectioned in the same oblique plane, starting proximally on the fifth and ending somewhat distally on the fourth, preserving all the hypothenar tissue possible.

INFECTIONS

In chronic and sub-acute infections such as are seen in some human bite and secondarily infected tuberculous dactylitis cases, metacarpal-phalangeal amputation can be carried out as already described and the wound left open. Healing by secondary intention will usually occur rapidly, co-aptation of the hand wound being attained by appropriate use of the compression dressing and splinting. The wound should not be packed open. A similar procedure in neglected fulminating infections is occasionally necessary to salvage the hand threatened by an already useless finger. It must always be remembered that these steps are irrevocable. The surgeon must be certain that the procedure is indicated.

DEFORMITIES

Old stiff or flexed functionless fingers following infections, or old severe Dupuytren's contractures, unsalvagable by means of tendon transplantation, capsulotomy, arthroplasty, fascial excision and skin grafting or re-positioning, should be removed. Such instances almost always permit the formation of an elective amputation scar.

TUMORS

Benign solitary tumors may occasionally make a finger an unsightly nuisance which can be removed easily by an elective amputation. The unsightly and deformed hands of multiple endchondromata are too useful as they are to sacrifice a digit without the most definite indications. Malignant tumors which threaten life must be most carefully evaluated before an attempt is made to cure by a combined hand and finger amputation while trying to have a functional hand.

POOR STUMPS

Poor stumps are often the result of inadequate surgical care. Faulty judgment as to the vitality of the soft parts, closure under tension, incorporation of digital neuromas in scar tissue under pressure, vasomotor disturbances arising both from the accidental trauma, surgical errors, absence of a compression dressing and elevation, all play their role in giving the patient not only a useless stump but a useless hand as well.

Simple, clean-cut, indicated surgery will obviate the great majority of unsatisfactory results.

Discussion by STERLING BUNNELL, M.D.

In amputating fingers the tendons should be drawn down and cut off, never sutured together over the finger stump. This would limit the motion of the other fingers as they pull from a common muscle. Proximal to the interdigitation of a hand, tendons should be sutured across the stump to move the wrist. A finger to be discarded may be filleted, that is, boned, and the skin used to cover a defect. It is better to have a good end to a finger, even though shorter than a longer finger with an unusable stump. Whenever we have the soft parts we can lengthen a stump by grafting bone. Painful neuromata are due to attachment of nerve ends in scar tissue and follow amputations in which there was infection. Whether to amputate a metacarpal well back rather than leave its head as a stump in a marginal ray depends, I think, on the type of patient, a strong, broad palm being useful for hard work. If a hand is amputated in a central ray, the adjoining fingers will cross on flexion so it is better to remove the metacarpal to its base and jog the marginal metacarpal over to take its place. When all digits are amputated, it is better to remove the second and fourth metacarpals for deep, wide clefts, phalangizing the hand to three digits. If only a few digits are left, they should, by osteotomy, be made opposable and the spare tendons in the forearm should be transplanted into their tendons for added strength.